but can be mundane. Many beginning faculty members want their first papers to be 'home runs'. But, 'home runs' come after the lab has momentum, and the way to gain that momentum is to start producing as quickly as possible.

Do you think there is an increased trend towards translational research?
Throughout the history of modern science there have been times when political or societal needs have set the agenda for scientific research. For example, World War II accelerated research in a number of areas related to communications and weapon systems. So the present push towards finding cures for the major illnesses that plague humankind today is understandable. That said, I find the extent of the present translational rhetoric a bit troubling for two reasons. First, there is a phenomenal amount of human suffering that today could be alleviated with the knowledge, medicines and technology that we already have, if the political will were there. Second, I believe that much of what drives discovery by scientists is sheer curiosity, and the desire to solve puzzles. It is a mistake to forget that the creation of new knowledge, for its own sake, is an important part of what makes us human. At the same time, science is increasingly expensive and technologically demanding, and our fellow citizens pay for it. Therefore, each of us has the responsibility to honestly, to the best of our ability, attempt to create new knowledge. Some of this new knowledge will be directly relevant to curing human disease or other important society issues in the short-term. Some of the new knowledge may change conceptual frameworks in ways that are unpredictable, with unpredictable consequences, on both short-term and long-term timescales.

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Quick guide

Prosopagnosia

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What is prosopagnosia?
Prosopagnosia — from the Greek prosop for 'face' and agnosia for 'ignorance' — also known as face-blindness, is an impairment in the ability to recognize other individuals by their faces, sometimes even those of parents, siblings and spouses (Figure 1). Despite its potentially distressing social consequences for sufferers, this disorder has proved a boon to cognitive neuropsychology research, providing some of the earliest and strongest evidence for the existence of 'face-selective' processing in the human visual system. Although first systematically observed only 60 years ago by Joachim Bodamer, prosopagnosia is now the subject of an extensive literature. Despite what you may have heard, prosopagnosics seldom mistake their wives for hats.

What causes prosopagnosia?
Prosopagnosia can be 'acquired' as a result of brain damage, specifically from lesions to the occipito-temporal region. In recent years, there has also been growing interest in quantifying lifelong impairments in face recognition, known as developmental or congenital prosopagnosia. In such cases, the etiology is often unknown, but evidence of familial inheritance suggests a genetic component in at least some individuals. Recent research has also examined whether links exist between congenital impairments in face perception and social developmental disorders like autism.

What cognitive systems are affected in prosopagnosia?
Impairment of any number of cognitive systems, from perception to memory, could result in a failure to recognize

Figure 1. Prosopagnosia.
In Giuseppe Arcimboldo's The Vegetable Gardener (Natura), prosopagnosics can see the vegetables, but not the face. Object agnosic CK, on the other hand, easily perceives the face but not its unusual composition. (Sistema Museale della Città di Cremona — Museo Civico "Ala Ponzone".)

familiar faces. Yet, although prosopagnosia is often accompanied by mild to moderate difficulties in object recognition, prosopagnosics may learn to rely on non-face visual cues, such as hairstyle or gait, for recognition, as well as information from other modalities, such as voice. This allows many prosopagnosics to discern facial characteristics such as gender, age, and emotion. Prosopagnosia is therefore commonly conceptualized as reflecting damage to a cognitive system specific to visual processing of facial identity. Supporting this idea, Moscovitch and colleagues (1997) described a patient, CK, with a severe deficit in general object perception whose face recognition was nonetheless intact. This 'double dissociation' between prosopagnosics and object agnosics like CK supports the existence of two separate visual processing streams for faces and other objects.

What neural systems are affected in prosopagnosia?
Acquired prosopagnosia is frequently associated with bilateral (occasionally unilateral, right) damage to extrastriate visual cortex, particularly the

fusiform gyrus. This relatively posterior locus of injury buttresses the view of acquired prosopagnosia as a disorder of visual processing. Although people with developmental prosopagnosia have no obvious lesion in the fusiform gyrus, recent work suggests that there is a subtle alteration of the white matter connections in this region of the brain. Neurons in this area have been shown to respond vigorously, and selectively, to the visual image of faces.

Aren't faces just harder to recognize? Or the subject of greater experience? In fact, several such alternative explanations have been proposed. Many are variants on the 'individuation' account, which holds that special processing for faces is not specific to this visual stimulus category. Proponents of this view note that faces are a special category of object for which we constantly identify individual exemplars, whereas such 'subordinate-level' processing is seldom necessary for recognition of other classes of object. In line with this view, some prosopagnosics demonstrate impairments in individuation of other object classes, such as specific animals. But this within-category impairment may reflect damage to adjacent but separate cortical areas. Furthermore, some experiments have still found specific impairment for faces versus other object classes in prosopagnosic subjects when the difficulty of individuation for these stimulus sets is matched. The issue of the specificity of the deficit in prosopagnosia remains an active area of debate.

Where can I find out more?

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Mediaeval artists: Masters in directing the observers' gaze

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The gold leaf in early Renaissance paintings such as Duccio's "*The Annunciation*" (1311) appears to glow when lit by candles as the artist would have expected. Subjectively, the candle-lit painting appears drastically different from the same painting illuminated with diffuse daylight typical of modern art galleries. By analysing the density of observers' eye fixations when looking at this painting under these two lighting conditions, we found objective differences in where in the painting observers attended: specifically, the glow of the gold induced shifts in fixations to symbolically important regions of the painting.

To investigate the effects of illumination on the perception of mediaeval paintings, we first constructed an area of gold leaf, using the techniques of the Italian Renaissance painters, and measured its reflectance properties. We also measured the spectral characteristics of beeswax candle light and daylight illumination. This allowed us to mimic the effects of such light sources on gold. On the basis of these data, we then used photorealistic computer graphics to render a high resolution digital scan of the original painting under both beeswax candle illuminant and daylight illuminant (see Supplemental experimental procedures in the Supplemental data available on-line with this issue). In the behavioural experiment, we had two groups of human participants view one of the two rendered pictures while we measured their eye movements. Figure 1 shows how the nature of the illuminant affected where in the picture the participants fixated in the picture.

The gold leaf, which is used so extensively in paintings of this era, creates a dramatic glow effect when lit by candles, which would have been the contemporary illuminant for these paintings. This glow effect leads the eye to fixate in a different part of the image than when ordinary diffuse daylight illumination is used. In the case of Duccio's *Annunciation*, observers look less at the faces of the Angel and the Virgin and more towards the Virgin's hand. One might speculate that this is the eyes being directed away from the faces (looking at them directly might have been considered irreverent). Alternatively, the eyes could have been directed towards the Virgin's hand, which she uses to grasp her veil and to gather her mantle around herself protectively. Her gesture has been claimed to reflect a state of mind somewhere between disquiet and reflection, consistent with the early stages of the Angelic Colloquy or the interaction between the Angel and the Virgin [1]. The methods used by this great Italian painter appear to exploit the effect of 'glowing' gold to direct the viewer's eyes.

Our results raise two important scientific issues. First, why does the subtle induction of 'glow' have such a significant effect on eye movements? Sources of illumination are often the most perceptually visible regions in a visual scene. Traditional low-level salience models of eye movement control [2] would predict a high fixation probability of these regions. In the current experiment, however, eye movements were not directed toward the brightest parts of the image, such as the gold-covered garments or windows under candle-light conditions, as predicted if fixations were driven by either brightness or the *global effect* in which saccades are directed to the centre of gravity